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ABSTRACT

Patterns of interaction, including power relations and social goals, were investigated by observing first-grade children over a 5-month period as they worked in small groups to compose stories on the computer. Three groups selected for in-depth analysis represent the wide range of observed interaction patterns. Differences in interaction patterns included emphasis on fairness, control, exploration, and social cohesion. Several social goals guided children's actions, including appearing competent to peers, dominating peers, and creating solidarity with peers. Differential status within the partnership was reflected in the variation in types of social behaviors that children displayed. Commonalities in interaction patterns among groups included using one another as resources, expressing opposition, directing versus instructing, and using self-monitoring and repetition. Agreed-upon strategies and plans emerged as facilitative in maintaining positive affect in contrast with negative and conflict-ridden exchanges. Focus on local concerns in composing was observed in all three groups, consistent with the level of development of first graders' writing off the computer. Suggestions are provided for modeling positive social interactions and higher-level compositional planning. Contains 47 references and 4 tables of data. (Author/RS)

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CIERA REPORT #2-005
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CIERA REPORT #2-005

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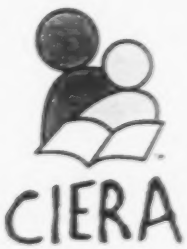
CIERA Inquiry 2: Home and School
Can young children write together on computers? What impact might their interaction patterns during such collaborative composing have on their literacy learning?

Patterns of interaction, including power relations and social goals, were investigated over a five-month period by observing first-grade children. Children worked in small groups to compose stories on the computer. Three groups selected for in-depth analysis represent the wide range of observed interaction patterns. Differences in interaction patterns included emphasis on fairness, control, exploration, and social cohesion. Several social goals guided children's actions, including appearing competent to peers, dominating peers, and creating solidarity with peers. Differential status within the partnership was reflected in the variation in types of social behaviors that children displayed. Commonalities in interaction patterns among groups included using one another as resources, expressing opposition, directing versus instructing, and using self-monitoring and repetition. Agreed-upon strategies and plans emerged as facilitative in maintaining positive affect in contrast with negative and conflict-ridden exchanges. Focus on local concerns in composing was observed in all three groups, consistent with the level of development of first graders' writing off the computer. Suggestions are provided for modeling positive social interactions and higher-level compositional planning.



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The Nature of Children's Interactions While Composing Together on Computers

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In recent years the use of technology in education has expanded, even extending into early childhood classrooms. Computers are frequently used to support literacy development through collaborative composing. Understanding the nature of children's collaborative interactions while working with computers on literacy activities is essential for two reasons. First, collaborative use of computers for composing has been proposed to offer several potential educational benefits. Computers provide potential logistic benefits for collaborative writing by reducing the physical demands of writing. While children who are writing together with pencil and paper will make critical comments about their partner's handwriting, the computer context places both children's contributions in legible text, possibly alleviating such contention (Dickinson, 1986). When children write collaboratively, it has been argued that they are exposed to alternative ideas and have the potential to negotiate the inclusion of their own ideas without the constraints of handwriting. In addition, working on computers with peers has been proposed to enhance student engagement, and some evidence suggests that working with others does positively influence motivation. The possible cognitive and motivational benefits of collaborative computer use have begun to be explored in the research studies reviewed below. Second, children often must work together because most schools do not have enough computers for each student to use individually. This logistic reality also makes collaborative interactions an important issue to consider.

Although there are both curricular and logistical reasons that children work together on computers, we have a limited understanding of children's experiences while doing so. During the initial years of schooling, children are developing social skills, which could potentially make the simultaneous demands of writing and collaboration difficult to accomplish. Although several investigations of collaboration and student use of technology have been completed with older children and adults (Colbourn & Light, 1987; Dillenbourg & Self, 1992; Tang, 1991; Zvacek, 1988), fewer studies have examined the collaborative process with young children (Dickinson, 1986; Heap, 1986; Paris & Morris, 1985; Shatz et al., 1996). In addition, while prior litera-

ture reveals the types of interactions that occur at specific points during the overall collaboration, the dynamics of how interactive patterns develop during the collaboration process remain unexamined.

The current study investigates how interactive patterns develop in collaborative activity through a microlevel analysis of first-grade children who elected to work collaboratively while composing on the computer. Specifically, through the examination of three case studies, this article addresses the following questions: a) What patterns of interaction develop during the collaboration process? b) How do children's interactions relate to their social goals? and c) Do children's collaborative interactions reveal differential status among partners, with implications for the quality of their composing experience? This study draws upon the theoretical perspectives of both sociocognitive and sociocultural theories of cognitive development and research in five areas: (a) the social nature of composing, (b) collaboration and status, (c) collaborative computer use and motivation, (d) children's forms of interaction while composing on computers, and (e) the competencies needed for collaborating on the computer. It also draws on a larger series of studies of the school and classroom contexts; teachers' beliefs and practices; in-class reading, writing, and computer use; and small-group or solitary writing on computers in the school media center (Nicholson et al., 1998).

Theoretical Perspectives

The potential benefits of collaborative activity are supported by both Piaget's and Vygotsky's theories of development. In their contrasting perspectives on development, both Piaget and Vygotsky present the importance of interaction with others for learning. According to the Piagetian perspective, collaborative activity fosters intellectual development by exposing participants to alternative ideas. Through the process of reconciling these dissonant views, children are thought to develop more complex understandings and critical thinking skills (Ames & Murray, 1982; Mugny, de Paolis, & Canugati, 1984). Piaget (1959) proposed that children learn more effectively through collaboration with peers rather than adults because peers provide more equitable partners for interaction. In this relatively balanced situation, children are more likely to express disagreement and suggest ideas rather than concede to others (Tudge & Winterhoff, 1993). During collaborative computer use, cognitive development should be enhanced when children express disagreement, suggest ideas, and offer alternative suggestions. However, we have limited understanding of how young children actually respond to each other while composing collaboratively, and whether they can express disagreement and still maintain positive, productive interactions.

Vygotsky's theory is rooted in the premise that development occurs through interactive experiences as the learner engages in activities that he/she could not do alone, but can accomplish successfully with the support of the more skilled partner (Vygotsky, 1978). This joint activity involves the use of mediating tools, which could be discrete symbolic systems such as language or

numbers, or symbol manipulating devices such as computers. Although Vygotsky's theory tends to focus attention on the role of the adult as a more skilled partner in the learning process, this perspective has also been applied to peer collaborative situations (Brown et al., 1993; Tharp & Gallimore, 1988). The opportunities for learning through peer interaction exist because children vary in their strengths, preferred modes of expression, and levels of competence. Partners with differing skills and competencies can therefore provide each other with the skilled assistance needed to extend the others' competence. The roles of skilled partner and learner may alternate during the collaborative activity, depending on the activity's demand for different competencies. According to this theoretical perspective, when children use computers collaboratively, development will occur when partners have different areas of competence and interact positively in dialogue that includes questioning, providing elaborated responses, and instructing. Such facilitative interactions require attentiveness, empathy, and responsiveness to one's partner. The quality of children's ongoing reciprocal exchanges is therefore a critical consideration for whether these interactions will contribute to development.

This study focuses on children's interactions during the process of collaborative composing. From both Piagetian and Vygotskian perspectives, the interactions occurring during this activity play a critical role in advancing children's understanding. The quality of children's interactive experiences, or their process of engaging in the task, is of critical educational importance. Examining the products of children's work does not reveal the nature of their experiences in its creation. Fisher (1994) proposes that focusing on the finished product "obscure(s) the richness of the composing processes that have taken place and may provide a partial and misleading view of the value of the task" (p. 252). The brief products that often result from young children's collaborative composing eclipse the revisions and deliberations behind them. After examining collaborative composing among seven-year-old partners, Fisher (1994) emphasizes that the children's experience was of greater value than was conveyed by the composition product. She notes, "clearly the written text does not fully capture the richness of the children's talk" (p. 255). This study focuses on the nature of children's interactive experiences during the writing process.

The Social Nature of Composing

Recent theory on the development of literacy has stressed that, in addition to its cognitive aspects, literacy has an inherently social nature, making literacy activities potentially conducive to collaborative learning. Dyson (1993a) emphasizes that the process of learning to write in contemporary early elementary classrooms is a social activity, fundamentally tied to children's participation in their peer social world. In an extensive program of research in early elementary classrooms, Dyson (1993a) has observed that young children "began to use writing to accomplish social work, that is, to maintain and manipulate their relationships with peers" (p. 12). Social work therefore involves efforts to accomplish individuals' social goals, such as the aim of making a connection with a peer, or of asserting one's superiority. Through interaction with peers, Dyson (1993b) proposed that children learn how to elicit approval, gain attention, and in other ways manipulate peers'

responses to themselves as they become skilled in using writing as a tool for accomplishing desired social ends.

These findings suggest that having children write collaboratively corresponds with the inherent social nature of writing activity, and that interactions during such collaborations will involve efforts to accomplish social goals, such as forming and maintaining relationships, promoting one's social standing, and establishing others' social position within the peer group. We are defining social goals for this study as the social purposes regarding negotiation of relationships that guide children's composing activity. Collaborative writing provides opportunities for social positioning both within the group and in relation to other groups. The social goals that children adopt will affect the nature of their interactions with peers.

Collaboration and Status

Research on how status characteristics influence group interactions reveals that peer collaboration is not necessarily an equitable arrangement. Cohen and colleagues have shown that during small group interactions, stratification processes often occur, resulting in status orders in which group members have differential relative status (Cohen, 1992; Cohen & Benton, 1988; Cohen & Lotan, 1995; Cohen, Lotan, & Leeder, 1989). Children's (second through sixth grade) relative status within the group influences their opportunities for participation during small-group activities (Cohen & Lotan, 1995). Research findings suggest that high-status children are more likely to participate in the group; act like facilitators; give, receive, and request help; and respond negatively to help from lower-status children (Cohen & Lotan, 1995; Dembo & McAuliffe, 1987). Dembo & McAuliffe (1987) also found that children designated as high-status showed higher rates of social interaction and social initiative behavior.

While the previous studies have examined status as a stable characteristic, using sociometric measures, Streeck (1983) has approached status relative to one's peers as a situated, socially negotiated position. In a study of communicative process among schoolchildren seven to nine years of age, Streeck (1983) describes the social interaction occuring during activity as encounters, which "can be regarded as locally established and sustained systems of integration" (Streeck, 1983, p.1). This perspective is consistent with Dyson's view of literacy activity as having situational purposes, meanings, and relationships that the participants establish. Streeck examined children's interactions during peer teaching events, during which the children acted independently, with little adult contact.

Streeck describes children's negotiations as revolving around issues of rank, which refers to children's position relative to others in the group. He established children's rankings within the interactive encounters based on observed interactive behaviors. Children's rank was connected to their display of controlling the plans for the activity and behavior of participants. Participants with higher rank successfully enlisted others to execute their suggestions and succeeded at controlling the course of activity, inducing others to enact or comply with their plans and/or interests, and subverting others' plans. Streeck also describes rank order as evident through differen-

tial distribution of attention, with participants attending more readily to the contributions of high-ranking members. This does not mean that high-ranking participants speak more, but rather that others listen and respond to their contributions. Children, therefore, have a particular status, which can shift within the course of activity, as defined by their ranking relative to others in the group.

In this study, children's status will similarly be examined within the course of interaction. Consistent with Streeck's (1983) work, and in contrast to research that has defined status as a static, enduring characterisitic of an individual, status within this study is viewed as locally established within the course of a particular activity. Status is viewed as a socially negotiated level of social position relative to one's collaborating peers.

The findings on status and collaboration suggest that when children compose together, issues of relative status are likely to influence individual participation and the social dynamics between partners within the collaboration process. Prior findings suggest that children's status will be visible through specific distinctions in interaction patterns, with lower status members exhibiting less participation and control over the activity. Children with high social status are those with greater control, who are able to impact the content and process of composing and their peers' interactive participation in the activity. This investigation will extend prior literature on how status influences social interaction and how it is negotiated within interactive situations by examining these issues (a) among collaborative groupings of children, (b) within the context of computer use, and (c) during the process of composing.

Collaborative Computer Use and Motivation

In a series of studies, Perlmutter et al. (1989) revealed the need to look beyond the cognitive impact of collaboration to consider the motivational influence of working with peers on computers. Perlmutter et al. (1989) examined both cognitive and motivational outcomes of collaboration and took a developmental perspective on the impact of collaboration among young children (two studies with four- and five-year-olds, and a third study with children ranging from four to seven years of age). Their findings with simple prereading and counting computer games confirmed that young peers can effectively interact, using instruction and direction to facilitate problem solving activity. Among five-year-olds, both observational and child ratings showed higher satisfaction when working with a peer than when working alone. However, when children of the same age worked together on a more complex EZlogo task, the amount and quality of assistance dropped over time. Although peer interaction did not improve learning, based on posttest scores, children in pairs were observed not only to display more positive affect, but to stay at the computer longer. However, a decline in the amount and quality of social interaction was observed over time.

When the task was made more open-ended and complex, and a larger range of ages were included, the results showed the impact of task complexity and developmental competence. Cognitively, peer interaction was associated with higher scores for elementary-aged children, but not for preschool chil-

dren. Regarding motivation, the observations of more positive affect among pairs was only observed for the elementary age children. However, the younger children did show greater engagement in terms of less off-task behavior when working with a partner. The authors conclude that for those just mastering skills, the presence of a peer may not lead to cognitive benefits, but is likely to provide motivational benefits. They also determine that, particularly when tasks are complex enough to challenge children's level of competence, the demands of social interaction may impede young children's performance.

The studies by Perlmutter et al. (1989) reveal the importance of examining how young children engage in the social demands of complex collaborative activities. However, the task of collaborative writing involves a degree of complexity that exceeds the previously described studies. Although the tasks involved in the previous studies of collaboration differed, they both had a clear, appropriate end state on which both partners could jointly focus. In the case of collaborative writing, this end goal is not as well-defined. Although both children can share the goal of some written end product, the form and content of this product can vary widely. Sulzby (1992) found that some first graders, when given the task of jointly planning a collaborative composition, whispered together that they would collude to deceive the researchers and actually write two different stories instead of one. The evidence within prior literacy research showing children's use of writing to accomplish a range of personal intentions suggests that reaching a common vision for the end goal while writing collaboratively may be a difficult task. Children need to negotiate, moderating their own personal intentions for writing to achieve a common goal for the activity. The open-ended nature of the writing task makes collaborative writing a more complex activity than those described in prior literature on young children's collaboration.

Children's Collaborative Composing On and Off Screen

Research on collaborative composing within the classroom context has examined numerous aspects of the nature of children's interactions while they collaborate on literacy tasks, including the frequency, nature, and task relevance of their talk. Dale's (1994) research with older children demonstrated the influence of affective tone— the overall tone of the verbal interaction, with adversarial conflict indicating a negative tone and demonstration of enjoyment or the absence of hostile conflict indicating a positive tone—on the success of the collaboration. Students had difficulty maintaining positive working relationships as coauthors when a student (a) was perceived to have weak mechanical skills, or (b) appropriated a judgmental, didactic role. These findings suggest that successful collaboration on composing tasks depends not only upon conversation and conflict, but also on a positive social environment for engaging in such disagreement.

Few studies have examined collaborative composing in early childhood. Dickinson (1986) examined the incorporation of a microcomputer in a first-second grade writing program. He found that young children could negotiate collaborative writing experiences on computers and often chose to write with a peer. During collaborative writing, the children used each other as resources, were task-focused, and concentrated on localized task

completion. In Dickinson's study, the computer fostered collaboration by presenting legible, uniform texts that reduced children's tendency to focus on issues of penmanship. Several differences were evident between solitary and collaborative writing sessions. During solitary writing sessions, children rarely displayed planning talk, monitored what was written, or responded to other's writing. During collaborative writing sessions, children interacted frequently, corrected each other, sounded out words, named letters, and discussed punctuation and spelling. Planning talk focused most frequently on discussion of local content (defined as "talk about the next word or phrase," Dickinson, 1986, p. 364) and sharing experiences, seldom attending to meaning and style. The children expressed reactions to their joint writing that conveyed a positive sense of joint achievement.

Shatz et al. (1996) expanded the research base on young children's collaborative computer composing by linking the process of collaboration with the quality of the written products produced by low income African-American first graders. The authors hypothesized that the quality of the interaction as defined by affective tone and symmetry of dyadic activity would predict the conventionality of the written product. Results of the study revealed that affective tone was more predictive of literacy outcomes for all dyads than was symmetrical interaction. Similar to previous research (Dickinson, 1986), most of the children's language throughout the interactions was task-focused, and children focused more on monitoring than on planning their ongoing writing. While this study made the important link between process and product in children's collaborative computer composing, the authors did not address children's status characteristics or the social goals they negotiated while writing and interacting together on computers. The results point to the need to attend to the affective tone during the collaboration process.

Competencies Needed for Collaborating on Computers

While Dickinson (1986) and Shatz et al. (1996) report successful collaboration among young children, some research suggests that the concurrent social and cognitive demands of working on tasks collaboratively may strain or exceed young children's social competencies (Daiute, 1992). Based on her case-study findings with seven-year-olds, Daiute (1992) proposed that children this age may be too young to consider the story goals of others while at the same time attending to the technical aspects of writing. Daiute and Dalton (1993) found that young children may not sensitively transfer control among partners. They observed that children not using the computer had to seize control from their peers. The fact that learners had to demand control has important implications for the effective functioning of collaborative composing groups in early childhood settings.

However, contrary to Daiute's concerns, Fisher's (1994) findings suggest that seven-year-old children do have the skills to compose together on computers. In his study of collaborative writing activity on computers with three groups of children, composed of 7-, 12-, and 14-year-olds, respectively, children's talk was task-focused and cooperative. Even the 7-year-olds showed adequate social and discourse skills to reflect on partners' suggestions, negotiate between contrasting propositions, and build on each other's

ideas. Across ages, the children described by Fisher succeeded in taking on a shared perspective with which they both identified.

Summary

The benefits of collaborative writing have both theoretical and empirical support. Investigations of children's literacy development off-screen suggest that the development of literacy skills is inherently social and is intricately tied to the accomplishment of social goals. Social interaction among participants during joint activity is proposed to enhance learning within both sociocognitive and sociocultural theories of development, providing theoretical support for the use of collaboration in educational settings. Literature on collaboration and status reveals that children's levels of participation and interactive behaviors during small group activities are influenced by differential status of the participants. For young children, some evidence suggests that collaborative computer use has more motivational than cognitive benefits, promoting engagement and positive affect. Literature on children's forms of interaction while composing on computers suggests that groups vary in the frequency and type of interactions that occur, and that these variations have implications for the effective functioning of the group. Having a joint purpose and positive affective relations among participants also enhances successful collaboration. Investigations have also found that young children's interactions while using the computer tend to be task-focused and emphasize procedural or context-bound concerns. Opinions regarding whether young children have the competencies to cope with the simultaneous social and cognitive demands of collaborative composition are mixed.

Although collaborative composing on computers has theoretical and empirical support, our understanding of how children actually approach the process remains limited. In view of these prior findings, the current study examines the dynamics of children's collaborative interactions while composing on the computer. This investigation extends the previously mentioned research to include consideration of children's social goals, power relations, and patterns of behavior during collaborative story writing on computers. This investigation is intended to address three specific questions:

- What patterns of interaction emerge while children are working together on open-ended computer composing tasks?
- What types of social goals are displayed in children's interactions and throughout the composing process?
- How do children's interactions during collaborative activities reveal the influence of power relations in the creation of status hierarchies?

Method

Data come from three cases embedded within a larger series of studies in a school that has focused on the goal of incorporating computer-based technology into the classroom (Nicholson et al., 1997; Sulzby, Warner, & Tessmer, 1998). To provide contextual information for the cases, we have described the methods of the broader study, ending with a focus on case selection and issues of representation.

School

Ethnographic methods were used to study interactions in the 1994–95 school year (September to June) in two first-grade classrooms in a middle-class suburb of a large midwestern city. The school, then in its fifth year, was selected because of its commitment to implementing the use of technology across the curriculum in all classrooms, kindergarten through fifth grade, and because the staff approached the university for collaboration. While specific long-term technology goals for the school site included outfitting each classroom with a computer, linking the computers through a local area network (LAN), providing internet access, and providing teachers with additional technical tools, at the time of this study, the LAN and internet access were not available, and each grade level shared one computer that was wheeled around from classroom to classroom on a computer cart, staying in each classroom for only a few days at a time. Additionally, a group of teachers was available to support the use of technology for creating multimedia group projects (Sulzby, Warner, & Tessmer, 1998). Computers were also available in the media center.

Classrooms

Among the four first-grade classrooms at the school, two were selected for the study because both teachers expressed an active interest in integrating technology into their classroom curricula. Both teachers were members of the school's technology committee, a group that met to discuss goals and procedures for the short- and long-term process of implementing technology within the school. Both had taken part in group multimedia presentation work with the children in their classes. In addition, both teachers expressed interest in providing the children in their classes with additional literacy experiences on computers while working with the research team. The families of all 40 first-grade children (18 females, 22 males) in the two first-grade classrooms were contacted by letter and informed of the objectives and methods of the study. All families granted permission for their children to participate.

Overall Data Set

Beginning in September 1994 and continuing through June 1995, observations lasting between 2-3 1/2 hours were completed once weekly, using ethnographic techniques. The observations occurred in two different contexts, initially in the classrooms and subsequently in the school's media center. The weekly observations conducted in classrooms from September through December focused on documenting the following: (a) teachers' beliefs about how children learn to read and write, (b) teachers' goals for the use of technology in their classrooms, (c) actual literacy activities and routines within each classroom, and (d) individual children's composing experiences on and off of the computer. In addition to the ethnographic field notes collected during this period, semistructured interviews with both teachers were also conducted. The interviews were designed to address each teacher's teaching philosophy, classroom curriculum, and goals for using technology across the curriculum.

Specific Data Set

Between January and June 1995, weekly observations took place in the school media center where four Macintosh computers were permanently stationed. The study was moved to the media center because of the frequent rotations of the classroom computers, which prevented the possibility of observing children's composing experiences on computers over a period of time. Although the children were asked to leave their classrooms to compose stories on computers in the media center, this was not an artificial setting for studying children's use of computers within this school. Children at this school site routinely left their classrooms to use computers in the media center both individually and in small groups.

All of the children in the two first-grade classrooms were taken to the school media center to compose stories on the computer using *Kid Pix* (Hickman, 1994), an open-ended paint, draw, and text program. The children had one visit each week for three consecutive weeks. Three to four children from each of the two classrooms (making a small group of 6-8 total children for each observation in the media center) were selected by their teachers to visit the media center at each session.

The weekly visits in the media center lasted between 30 and 50 minutes. At the beginning of each first visit to the media center, two researchers explained that the children's task was to compose stories on computers using Kid Pix. The researchers explained that the children were to select their own writing topics and decide whether they wanted to work individually or in small groups (2-4 children). Children who chose to work in groups were responsible for selecting their partners and for negotiating the process for turn-taking among the group members. At the beginning of every session, the children were encouraged to plan the content of their computer stories. The researchers led a short group discussion in which each child or small group of children was invited to share their story ideas with the other children. Children were then invited to select a computer and begin composing individually or with their selected partners. The researchers were

available for technical assistance, but avoided direct involvement in the children's interactions and composing whenever possible. At the end of each session, the group reconvened to allow children to share their stories with one another. Children saved their stories on disk after each session so they had the option of working on them over the three consecutive weeks.

The data set for the current study comes from a variety of sources including weekly observational field notes, audio recordings, video recordings, teacher interviews, and student artifacts (e.g., computer generated stories). Field notes were completed for sixteen 2-3 1/2 hour observations in the classroom and sixteen 30-50 minute observations in the media center between September 1994 and June 1995. Audio recordings were made of all classroom observations. Audio and video recordings were made of all media center sessions. Interviews were completed with both first-grade teachers at the beginning of the study in September 1994. Fifty-nine separate computer files, with at least one file for 39 of the 40 first graders across the two classes, compose the total student artifact data. (Data for one male student is unavailable.)

Case Selection

The children chose to group themselves in various ways. The majority of boys chose to work with another male partner, while the majority of girls selected to work independently. (Discusion of gender issues is available in Nicholson et al., 1998.) Of the 40 children, 27 children chose to work in some form of collaboration and 13 wrote alone; there were 8 male dyads, 2 female dyads, 1 female triad, 2 mixed-gender dyads, 4 males working independently, and 9 females working independently. Because the focus of this paper is to describe the process of children's collaborative composing experiences on computer, children who chose to work independently were not selected as target cases. Our objectives in choosing cases for in-depth analysis included selecting (a) children arranged into different types of groupings (e.g., same sex dyads, triads, mixed-gender dyads); (b) groups that continued to work together over the three composing sessions; and (c) groups whose collaboration styles were in marked contrast to one another. This last criterion was deemed important because we aimed to describe various ways that children responded to the collaborative composing activity on the computer. Because we were interested in the range of behaviors displayed by the children working together, we purposely sought to select cases that displayed a wide range of interactive patterns of behavior.

Based on these criteria, three case studies (one mixed-gender dyad, one male dyad, and one female triad) were selected for in-depth analysis. Because only three groups out of a possible 13 were chosen for in-depth analysis, we recognize that the target cases do not represent the entire range of children's behaviors exhibited. Our aim was not to generalize these three cases to all children's experiences, but to offer a window into the diverse experiences children have while working together to compose on computers. Towards this end, our primary goal was not to select cases based entirely on their representativeness, but instead, to choose cases that presented a depth and complexity which inspired continued investigation and refinement of current theory (Stake, 1994).

Data Preparation and Analysis

One hundred and three pages of transcripts were constructed from the audiotapes of the three groups' successive computer composing sessions. Each audio transcript was then expanded to include contextual information recorded from field notes and corresponding videotapes for composing sessions when available. All utterances and nonverbal behaviors represented on the transcripts were coded by the first two authors using the constant comparative method (Glaser & Strauss, 1967). This method begins with the construction of initial codes that are compared with new data until each emerging individual code is mutually exclusive. All coding was completed by the first two authors. Codes were constructed to represent each new behavior and verbalization made by the children within their collaborative groups. All codes were constructed to represent the objectives of each child's verbalizations and/or actions. Examples of the various codes include defending control, opposing a partner's suggestion, directing a partner, and suggesting an idea.

As the data were reanalyzed and new data were examined, our initial codes were revised and new codes were created (Miles & Huberman, 1994). This recursive process of coding continued until all behaviors and verbalizations were conceptually categorized. Although the codes were constructed to be mutually exclusive, the children's utterances and behaviors were often represented by two or more codes. Similarities and differences across codes were noted and a conceptual mapping was made of the main themes emerging from the data (Miles & Huberman, 1994; Ogbu, 1981; Smith & Keith, 1971). These themes related to (a) the social goals children constructed for their participation in the composing activity (e.g., fairness and equity, competition, frightening classmates); (b) strategies used for handling turn-taking among group members (e.g., "word by word," perceived competence); (c) strategies used for the negotiation of story content; and (d) the amount of influence and control children had over their own participation and their partners' participation in the activity. The conceptual mapping of the data's emerging themes was then compared and contrasted to the salient themes described within the existent literature.

Trustworthiness of the data was achieved by independent examination and coding of the transcripts by the first two authors. After independent coding, the author's conceptual codes and categories were compared, and any disagreement was discussed until consensus was reached. Following this process, both authors re-examined the transcripts in reference to the revised coding categories. Additionally, the children's behaviors and verbalizations were compared across time (i.e., the children's successive visits to the media center) for consistent explanations, relationships, and patterns as well as negative or inconsistent examples (Denzin, 1970; Miles & Huberman, 1994; Silverman, 1993).

In addition to the above analyses, interviews and field notes were reviewed for evidence of children's prior experiences with *Kid Pix* and collaborative work with peers in their classrooms. We reviewed this information retrospectively since no systematic data on children's prior experiences were collected at the commencement of the study. All of the children had been introduced to *Kid Pix* by their classroom teachers; however, they varied in their amount of experience with the program. Teacher interviews and field

note data suggest that working at the computer either individually or with peers was a familiar activity to children in both classroom contexts. Working together using *Kid Pix* to compose a jointly constructed computer story was, however, a new experience for most of the participating children, including the seven children in the three cases analyzed here.

Instructional/Activity Context

As described above, the first four months of data collection involved conducting weekly naturalistic observations in the children's classrooms. The female teacher is called Ms. Wells, and the male teacher is called Mr. Cole (both pseudonyms).

In Ms. Wells's classroom, children had many different opportunities to write off-screen. Four different contexts for composing in Ms. Wells's classroom were: (a) personal journals; (b) literature response journals; (c) math logs; and (d) the process writing approach used throughout the year for children to construct, revise, and eventually publish their stories. Ms. Wells encouraged children to choose the topics for their personal response journals and the texts they published through the process writing approach. Her emphasis for children's composing activity in the classroom was communication and dialogue between the author and the readers, as revealed by her attention to message clarity while working with the children to edit their work.

When Ms. Wells had a computer in her classroom, her students were able to select it as a choice during center time. When the children composed on the computer in her classroom, they could work individually or with other children, but they also had to work with an adult helper who could help guide them through the process of writing with a keyboard and saving their file. Ms. Wells stated that she would like her students to eventually have the skills to compose on the computer without requiring adult assistance. Her students used *Children's Writing and Publishing Center* for writing stories and *Kid Pix* for creating class books.

Mr. Cole also offered multiple contexts for children to write off screen within his classroom. These included (a) writing in personal journals where children were usually given a question to answer relating to the weekly theme, "What have I learned about the five senses?"; (b) writing a sentence to accompany a class project; (c) writing a page for a class book; and (d) publishing a story using the process writing approach. Mr. Cole initially monitored the topics children wrote about through his process writing program. Later in the school year, his students were encouraged to begin selecting their own writing topics. Children typically composed independently. Mr. Cole accepted emergent forms of writing (e.g., letter strings, invented spelling), but also encouraged his students to strive to write with dictionary spelling as much as possible.

Mr. Cole's main technology goal for the school year was to integrate computers more completely into his curriculum. He wanted the children in his class to learn to feel comfortable with the functional aspects of computer use (e.g., knowing the parts of a computer, how to handle a disk, how to take care of a computer). Beginning in January, Mr. Cole introduced *Children's*

Writing and Publishing Center and encouraged his students to begin to write stories on the computer independently. As he did with their off-screen writing, Mr. Cole encouraged the children to use conventional spelling and often assisted students in spelling words as they composed. Before January, Mr. Cole's students were introduced to several interactive books on CD ROM (e.g., Arthur's Teacher Trouble, Grandma and Me, Curious George's ABCs), a variety of math and reading skill-oriented programs, and *Kid Pix*.

Results

Interaction patterns observed within this collaborative composing activity involved a continual process of negotiating for control over the technology and story content. The children who elected to work in some form of collaboration sought to accomplish social goals related to making, maintaining, and manipulating relationships with peers (Dyson, 1993a). The children's discourse reflected their successive efforts to attempt to gain physical control of the mouse and keyboard, influence the construction of story content, translate their ideas into text and pictures on screen, and negotiate turn-taking with their collaborative partners. Gaining control throughout the composing activity involved complex social work for all of the children. Working together to compose a collaborative computer story was a "multi-media affair" (Dyson, 1993a) where children worked through talk, text, and drawings not only to accomplish the cognitive aspects of the activity but also to position themselves socially among their peer groups. Children's differential status within the peer group was reflected in the range of social behaviors they displayed and the amount of control—over the technology, the story content, and the management of peers— they successfully negotiated throughout the interaction.

The collaborative partners exhibited different interactive patterns during the task, reflecting the diversity of their social relationships, social configurations, and social goals. The interaction patterns of each of the three selected groups are described, in addition to the children's social goals, the social status hierarchies that emerged within each group, and the variables contributing to successful and unsuccessful collaborative composing events on the computer. All children's names are pseudonyms.

Charlotte, Kelsey, and Siddhi: Equality of Turn-Taking, Fairness, and Social Status

Charlotte, Kelsey, and Siddhi chose to work together on a retelling of *The Three Little Pigs* story. Siddhi originally suggested that she would like to write about "The three little wolfs and the big bad pig," while Charlotte and Kelsey initially planned to write a story about families. After the three girls decided to work together, they compromised and chose to write about a family of three little pigs. Interaction patterns of this group emphasized fairness in terms of an equality of turn-taking among the three partners. The

dominant shared social goal for this trio was the maintenance of equality. As a result, their interactions frequently involved the process of negotiating turns. The girls enacted a strategy to achieve an equitable distribution of turns by dividing the story sentences up word by word and then assigning one word at a time to each partner.

Example 1.

The girls are negotiating turns to begin writing their story, "Once upon a time, three little pigs. . ."

Charlotte: OK, then come over here Siddhi, you're going to put "time".
Charlotte: OK, I'm going to write "three" . . .
Charlotte: [to Siddhi] OK, it's Kelsey's (turn), you did so much! You're not allowed to do two (words). Erase this.

The girls arranged their chairs in a neat row in front of the computer screen and took turns typing in "their word." In the beginning, after each girl had completed typing in her word, she would move down one chair to the right, allowing the next partner to have her turn. However, moving seats so often quickly became unwieldy, and Kelsey suggested instead that they move the keyboard after each turn.

Their turn-taking strategy left the distribution of hard and, as Siddhi remarked, "cinchy" words up to chance. The girls acquiesced to using this strategy even if at times this meant less personal control over and/or satisfaction with their participation in the composing task. This is highlighted below in Siddhi's frustration after waiting her turn only to find that her word would be "a" (i.e., They lived in a cottage.)

Example 2.

Siddhi waits for her word, only to find out it is the article "a."

Siddhi: /aa/ -A-, how come mine is so easy? [complaining tone]
Charlotte: I know.

Example 3.

After writing "A" for her previous turn, Siddhi waits in anticipation for her next turn hoping this time she will have a longer word to type out.

Siddhi: I hope I don't have a little thing to do.
Charlotte: Look [laughs when she realizes that Siddhi's next word will also be easy], not that much.

The girls were very careful throughout their composing sessions to fairly distribute turns. However, their interactions also reflected negotiation of individual goals to assert control of the activity and/or the actions of one's peers. Social regulation of the process of turn-taking, the construction of story content, and personal control of their activity were not divided according to a standard of fairness, but instead were highly reflective of the social positioning of each child within the group. From the first utterance spoken within the composing task, Charlotte emerged as the collaborative partner with the highest status, followed by Kelsey, and then Siddhi, who clearly had the lowest status within this context among the three girls. Status in this activity related to the range and types of social behaviors children were observed to exhibit. Charlotte's higher status was reflected in her initiation of behaviors that were less-frequently displayed by Kelsey, and often absent from Siddhi's behavioral repertoire (see Table 1).

These higher-status social behaviors included directing others' actions and turns, negotiating for her own turn, correcting others, providing information, and suggesting ideas to the group. Thus, although the sequence of turns was equitably determined by the girls' "one-word" strategy, the regulation of their composing process was not the result of a balanced sharing of power and control among the three partners. Instead, the higher-status behaviors that included more control, power, and personal autonomy were predominantly the privilege of one member, Charlotte. Through her efforts to direct others, provide information, and make suggestions to her composing partners, Charlotte shaped the story content more significantly than the other two girls and controlled their behavior. The various social behaviors initiated by the girls and their differential status related to these social behaviors are reflected in the dialogue excerpts below. (The girls show some inconsistency in their parsing of sentences that include "a" into word units. In the first example "upon a" was treated as a single word. In the second example, "a" is considered a separate word in the phrase "They lived in a cottage.")

Table 1: Charlotte, Kelsey, and Siddhi: Social Interaction Behaviors

Child	Frequent Social Behaviors Employed by Child Throughout Interaction	Social Behaviors Present but not Frequently Observed Throughout Interaction
Charlotte	Directing others' behavior and turns Negotiating the turn-taking process Providing information Suggesting ideas Evaluating others' product Requesting an explanation Returning group to task focus Correcting others Declarative planning	Asserting a turn Requesting a turn Defending competence Defending self Defending idea Complimenting others
Kelsey	Directing others' behavior and turns (to a lesser extent than Charlotte) Acknowledging others' ideas Negotiating the turn-taking process Providing information (to a much lesser extent than Charlotte) Requesting a turn Suggesting ideas Correcting others Declarative planning	Asserting a turn Defending self Evaluating others' product Requesting explanation Complimenting others
Siddhi	Asserting a turn Negotiating the turn-taking process Defending competence Requesting information Requesting a turn	Declarative planning Directing others' behavior and turns Evaluating others Correcting others Requesting explanation Providing information Suggesting ideas

Example 4.

Social behaviors and differential status as the girls begin to write, "Once upon a time . . ."

Charlotte: O.K., now, Kelsey, you're going to go, "upon a, upon a" and you're going to go "time." [to Siddhi] All right, you spell it -O- . . . OK, then come over here, Siddhi, you're going to put "time." (*directing turns, providing information, suggesting idea)*

Kelsey: First you have to go like this [to Siddhi] *(providing information)*
Siddhi: I know. *(declaring competence)* How do you spell it? *(requesting information)*
Charlotte: -T-I-M-E *(providing information)*
Siddhi: Where's E? *(requesting information)*

Kelsey responded to Charlotte's behavior with efforts to stake her personal claim—vying for power and control— by engaging in such interactive behaviors as assertively requesting a turn, correcting others, and often suggesting ideas for the story.

Example 5. Kelsey's social interaction behavior.

Kelsey: Charlotte, I want to um, do something. *(requesting turn)*
...
Charlotte: Once upon a time, three little pigs lived in a cottage and they were in
| danger
Kelsey: | danger || Everyday *(suggesting idea)*
Charlotte: No! We put a period. *(correcting others)*
Kelsey: Yeah, but then write everyday. *(suggesting idea)*
Charlotte: Everyday what? *(requesting idea)*
Kelsey: Everyday they just (the bad) wolf came and (had) some *(suggesting idea)*
Charlotte: Everyday, danger, everyday. [laughs]
Kelsey: OK, yes, now let's go everyday.
Charlotte: Use capitals. *(instructing)*
Kelsey: Everyday they, the big
Charlotte: Every day the *(correcting others)*
All: Big bad wolf came
Kelsey: and attacked them. *(suggesting idea)*
Siddhi: That's a good idea. *(complimenting)*

Siddhi was less successful at initiating social behaviors that offered control of the technology and/or story content. For example, Siddhi more often defended her competence to her partners, requested information (this often required displaying her lack of knowledge), and requested a turn, whereas she rarely if ever corrected others, directed their actions and turns, provided information, or suggested ideas.

Example 6. Siddhi is adding to their illustration of the little pig's house on screen.

Siddhi: Kelsey, come here, um, I messed up, I went over here on the lines and it won't work right now, can you help me? *(requesting help)*
Kelsey: Just draw what you like and then when you're done, we can do the lines over in yellow.
Siddhi: Can you help me, Kelsey? *(requesting help)* . . . OHH! [gasps] I did it on the grass.
Kelsey: TRY TO NOT do it on the grass! *(correcting)*
Siddhi: I can erase it . . . Kelsey, would you help me? *(requesting help)*
...

Siddhi:	I like scribbling.
Charlotte:	Yah, but you're not supposed to scribble. *(evaluating Siddhi)*
Kelsey:	What, do you want our story to turn out like this, Siddhi? *(evaluating Siddhi)*
Siddhi:	I can't [laughing].
Kelsey:	Siddhi, if you're going to start goofing *(warns Siddhi)*
Charlotte:	If you're going to start goofing, we're not going to let you do it. *(threatens Siddhi's participation in the group)*

Siddhi was also the only child who had to assert to her partners that she was owed a turn. This was in contrast to Charlotte who never had to assert nor request a turn throughout the entire interaction, and Kelsey who asserted and was ceded turns, although evaluated and occasionally overruled by Charlotte. While Siddhi's defense of her turns suggest the social goal of claiming power, her complimentary responses (see Example 5) and requests for help imply that maintaining the positive affiliations with her peers was an important social goal.

The members of this composing group spent the largest proportion of their time negotiating and discussing the turn-taking process. Other interaction patterns emphasized throughout their interaction included providing information and ideas to one another, acknowledging one another's ideas, and showing concern for monitoring their behavior and the ongoing construction of their computer story (e.g., monitoring mistakes, repeatedly reading the text on screen; see Table 4). Although fairness was essential to their understanding of the task, this was limited to an equitable distribution and sequencing of turns.

The control each girl exercised within her turn over use of the technology, the story content, and her peers, was not balanced in any "fair" or equitable way but instead was highly determined by the social positioning of each child in comparison to her peer partners. Charlotte's high status was evident in the greater range of social behaviors available that allowed her to take control over the technology, the story content, and the management and manipulation of her peers. For example, Charlotte directed, corrected, evaluated, and regulated the overall interaction. She also requested explanations from her peers for their actions, thus placing them in a position to defend themselves. Although Kelsey was observed to provide information and ideas, and to direct and evaluate her partners, she did so to a much lesser degree than Charlotte and often had to persist in her efforts before her ideas were accepted by Charlotte (see Example 5). Siddhi's positioning as the lowest-status member of the group was evident through her much more restricted display of social behaviors such as asserting, defending, and requesting. These behaviors offered her little overall control and influence within the collaborative activity.

Beth and Tyler: Ongoing Power Struggle

Beth and Tyler worked on a story they titled "August." This story emerged during a discussion they had with two other classmates, Kristen and Jake, just prior to composing. The four children decided they wanted to work on

a "pretend story" which was thematically organized around monthly parties at one another's homes where they would play and enjoy a feast. They suggested that in this story the parties would occur each "season" (month), but the feast would change. They decided to work in two collaborative pairs at adjoining computers (Beth with Tyler and Kristen with Jake). Beth and Tyler decided together to write a story about one of these pretend parties taking place in August, Beth's birthday month. Although the four children spent a large amount of planning time deciding upon the theme for their collective stories, they did little planning of the explicit content before beginning their collaborative work at the computers. The open-ended structure of their theme ("a party in August"), the incomplete planning of the elements of their story, and the lack of a familiar story grammar to frame their discussion (as with The Three Little Pigs) may have contributed to the conflict-ridden interaction patterns observed throughout Beth and Tyler's work together. While some partners focused on the composed product as a vehicle for achieving their social goals (see Balah and Jeff in the next section), these two partners did not have such a shared pursuit. There was no evidence of a shared social goal that supported cooperative relations. Instead, they focused entirely on their interactions with one another to accomplish their individual social goals of competitive social positioning.

Early on in the activity, the struggle for control of both the technology and the story content became an overriding problem for these two partners. Their interactions were marked with tension which continued and increased across the three composing sessions. The dominant interaction patterns evident within this group included disagreement, evaluation, and competitive social positioning. Throughout the majority of interactions, there was a negative affective tone between the two partners. Tyler emerged as the higher-status partner, consistently making comments to question Beth's competence and seeking peer corroboration for his evaluative statements.

Example 7.

Tyler leans over to speak to Kristen and Jake. He is evaluating Beth's efforts to use the drawing tools in an attempt to illustrate a tree on-screen as part of the picture of the front yard where the "August feast" would take place.

Tyler: Beth can't control the screen. Beth can't control the screen. Oh phew! Get over there, do something. *(seeks peer corroboration)*

Beth: I don't want to.

Tyler: She ruined the whole screen. *(seeks peer corroboration)*

. . .

Tyler: STOP! What are you doing? [Beth laughs] Beth, come on! What is that? *(evaluating her work)*

Beth: It's a tree.

Tyler: Want me to draw it? . . . [leaning over to Kristen and Jake] She's weird, she doesn't even know how to write this. *(seeks peer corroboration)*

Beth: Of course I do. *(defending competence)*

Jake: Beth, you're very weird. *(corroborating with Tyler)*

Kristen: Beth's going cuckoo on us. *(corroborating with Tyler)*

Beth: NO, I know how to draw one, I know how to draw a tree Tyler, I DO, you do not have to help [laughing]. *(defending competence)*

Tyler: If you mess up this time, I won't work with you. *(threatening her participation in the group)*

Tyler persistently directed Beth even when she had control of the technology, evaluated her work with critical statements and interrogative questioning, and persisted in attempting to control all aspects of the composing task. Beth's lower status was evident in her responses to Tyler's comments where she frequently defended her competence and sought to defend control of her turn and her ideas, and physical control of the technology. Following Tyler's persistently critical stance, and reinforcement by the peer corroboration he actively sought, on several occasions Beth also conceded.

Example 8.

Tyler is directing Beth to erase the screen after she accidentally uses the paint bucket tool and fills the screen with a background color. He directs her to return the screen to a white background.

Tyler: Now you got to erase all of this. (directing). What'd you do? Oh you put it all red. Oh, oh, what are you doing? *(evaluating her work)* We got to erase all of this [her work], come on.
Beth: Just a second *(defending control of her turn and her work)*
Tyler: What are you doing? *(evaluating her work)*
Beth: Hold it for a second, Tyler *(defending control)*
Tyler: . . . Get the eraser . . . now start erasing *(directing)*
Beth: I'm going to (erase) all of it now cause I made the whole entire mess *(follows Tyler's directives)*
Tyler: You have to erase all the screen . . .
Beth: Just a second. First one second. *(defending control)* Fine, I'll do that *(concedes)*, but I'm do:: ing it. *(defending control)*
Tyler: All right but just don't . . . NOT PURPLE, PUT IT ON WHITE, NOT PURPLE *(directing and evaluating)*

Because Tyler and Beth did not have a shared vision for the unfolding details of their story, a systematic turn-taking structure, or a pattern of acknowledging and agreeing with one another's ideas, their interactions were characterized by contentious affect and a constant struggle to defend their individual pursuits. Many of their utterances reflected the greatest of their concerns—that the pictures and text they had created or envisioned would be ruined by the actions of their partner. Thus, instead of building upon one another's ideas as other groups did, they both acted as if the partnership stood in the way of achieving their personal goals for the task. Their initial joint intention dissipated as they jockeyed for control within the interaction through socially positioning themselves as critical evaluator, defender, and aggressor. As is evident in the following excerpt, they often grabbed at the mouse and/or keyboard when they felt their partner was working in ways contrary to their individual goals.

Example 9.

Tyler is using the paint can tool to color in a blue sky.

Beth: You're not doing it right, Tyler.
Tyler: Arrr.
Beth: Just a second [frustrated tone, she reaches over to the mouse and begins clicking down on the rubber stamp icons causing them to show up on the screen]
Tyler: Oh, what'd you do?

Beth: Just a second, Tyler. . . I know what I'm doing.
Tyler: Beth, don't.
Beth: [sound of paint icon in background] Hold it a second [continues clicking on paint bucket]

The process of negotiating turns often involved challenging each other's competence and, when necessary, defending their own. Criticizing one another was a common strategy Beth and Tyler used to curtail their partner's turn and regain personal control of the technology, content, and status within the interaction.

Example 10.

Tyler is attempting to change the color of the words they are typing on screen to a light brown color.

Tyler: I know what I'm doing, Beth.
Beth: Yeah, like you really (know what you're doing). What is that?
Jake: Yeah, like you really know what you're doing, Tyler [sarcastically].
Tyler: I DO, Jake!
Beth: Looks like you don't.

In many instances they had different "plans" or desires for the design and/or construction of their August story. Whether Tyler was drawing the people too dark, or Beth, unlike Tyler, wanted to add a heart stamp next to Tyler's parents (Tyler had drawn them on screen as "kissing" party guests), they often found their visions of the August story to be markedly different. Without a joint purpose or understanding for their collaboration, they were left reacting moment by moment to one another's actions. This reactive interaction pattern left little time and effort available for cooperative planning or discussion of a shared purpose for their collaboration.

Example 11.

Tyler and Beth disagree about their plans for drawing pictures of themselves and their peers as the main participants in the "August feast" on screen.

Beth: YOU'VE GOT TO PUT THE WAIT, YOU'RE NOT DOING IT RIGHT.
Tyler: Beth, Beth—
Beth: You're not doing it right.
Tyler: Beth, Beth, DON'T.
Beth: I've got a different plan. Tyler. He's not that (color).
. . . .
Beth: Oh, do a heart. Come on, do a heart! Draw a heart. Do a heart Tyler. Oh, I know! Just, I know what, I'm doing this [attempts to click heart rubber-stamp icon]
Tyler: BETH, DON'T!
Beth: I know what I'm doing this time.
Tyler: I know what you're going to do, you're going to put a heart on it
Beth: Yah, [laughs]. Here, it's going to be a heart (falling). [places a heart stamp on picture]
Tyler: 'Scuse me [takes mouse and erases her heart stamp]. Erase.
Beth: Tyler Johnson! I'm going to get you [Tyler laughs].

Tyler and Beth's interactions were less successful than those within the other collaborative groups. The conflict within this group is reflected in the prevalence of statements pertaining to defending control and defending competence. This was especially the case with Beth, the partner with the lower social status as evidenced by the types of social behaviors she enlisted throughout the interaction (see Table 2). Most of their time was spent vying for control and negatively critiquing one another's actions. This competitive social positioning was most likely the result of the absence of several important elements of a successful collaboration: a shared goal or purpose for the activity, a mutually agreed upon strategy for regulating turn-taking, and the skills for building upon and incorporating one another's ideas. Although some of the male-female groups in the study did not display the interaction patterns observed with Beth and Tyler, it is also possible that the observed behavior patterns were influenced by the mixed-sex social configuration of the group (see Nicholson et al., 1998, and Thouvenelle, Borunda, & McDowell, 1994, for discussions of gender inequities and the use of technology).

Table 2: Tyler and Beth: Social Interaction Behaviors

Child	Frequent Social Behaviors Employed by Child Throughout Interaction	Social Behaviors Present but not Frequently Observed Throughout Interaction
Tyler	Directing partner's actions Evaluating partner Monitoring mistakes Opposing partner Requesting information	Defending self Requesting a turn Sharing control
Beth	Defending competence Defending control Directing partner's actions (to a much lesser degree than Tyler) Opposing partner Requesting turn Sharing control	Evaluating others Monitoring mistakes

Balah and Jeff: Joint Purpose and Social Cohesion

Balah and Jeff used a fictional storybook, Trapped in Death Cave (Wallace, 1984) —which they found in the media center and heard from a peer was the "scariest book in the school"—to inspire a horror story constructed to achieve their joint social goal of "scare(ing) the girls." Although neither boy was familiar with the contents of this chapter book, they used the pictures and selected words they could read as cues to inspire their computer story. The dominant interaction pattern displayed by these two composing partners emphasized a shared social goal of maintaining cohesion and joint purpose. In contrast with the two previous groups, these boys' individual goals appeared to be similar to their shared goal. Both boys negotiated collaborative roles across the activity according to their perceptions of their own and their partner's strengths. For example, if one boy was perceived to have a strength in writing, he was assigned to the task of writing. Balah and Jeff's management of turn-taking based on their perceptions of personal strengths is in marked contrast to the three girls' system of "management through equity," in which fair turn-taking was considered more important than individual skills.

Balah and Jeff began their composing activity with a joint purpose, which was reflected in their socially cohesive language and shared goal for the composing task.

Example 12.

The boys are discussing their objective to write a horror story to scare their female classmates.

Balah: [Announcing to peers] We're going to write a horror story!

...

Jeff: This story is going to be on death. Why don't we read it to the class!

Balah: Ours is going to be a very spooky story.

...

Jeff: We're writing a horror story! [both boys are laughing with excitement]

Balah: Trapped in Death Cave [boys continue laughing]

...

Jeff: Yah, and we're going to scare the girls, aren't we?

Jeff, in an effort to overcome his lack of relative abilities, made a consistent effort throughout their interactions to designate roles for their participation. As they began their work, Jeff declared that he would write and Balah should read because Balah was "the better reader." After having some difficulty writing, Jeff changes his position declaring his personal skill in reading and Balah's competence as a writer. The ongoing reorganization of roles, prompted by Jeff and accepted by Balah, led to a high frequency of utterances involving the negotiation of turns.

Example 13.

Jeff and Balah negotiate roles and turn-taking throughout their interaction.

Jeff: I'm the one who's going to WRITE.

...

Balah: I'll tell you what to write.

Jeff: You tell me what to write and I'll, you read it [the book] and tell me what it's like. You're a better reader than I [Balah describes the story to Jeff].

...

Jeff: [speaking to girls at another computer] He's the better writer, I'm the better reader.

Balah: OK, then you can do the reading.

Jeff: And you do the writing.

Balah: Now, we're going to be done fast.

Status differences were not as pronounced as they were with the three girls; however, analysis of the social behaviors each boy employed does reveal some distinctions (see Table 3). Balah more frequently provided information, suggested that they focus on the task, and defended control of his turn from Jeff's requests. Through these behaviors and others, Balah assumed slightly more control over the regulation of the activity than Jeff. Jeff was more often observed to declare and defend his competence, declare Balah's competence, and request a turn, all social behaviors that reflected his social status as somewhat lower than Balah's within the interaction. Although the boys' patterns of social behaviors suggest differences in their social status,

the fact that both boys assumed a full range of social behaviors reveals that status differences were not pronounced.

Table 3: Balah and Jeff: Social Interaction Behaviors

Child	Frequent Social Behaviors Employed by Child Throughout Interaction	Social Behaviors Present but not Frequently Observed Throughout Interaction
Balah	Providing information Opposing others Directing others Requesting information	Declaring competence Defending competence Requesting or negotiating turns
Jeff	Negotiating turns Requesting a turn Declarative planning Declaring competence Defending competence Seeking peer attention Making social comparisons	Providing information Requesting a return to task focus

Both boys acknowledged one another's ideas, agreed with one another's statements, and suggested ideas equally often throughout the interaction. They also corrected and directed each other, and opposed one another's ideas with approximately equal frequency. Although correcting and opposing could be signals of contention among partners, the boys generally maintained a positive affective tone throughout their interactions. In addition, Balah and Jeff both contributed to the construction of their horror story content and organization. There were many instances in which they built upon one another's ideas, scaffolding the composing process for each other by asking questions and making requests for clarifications.

Example 14.

As Balah reviews the first sentence on screen, "Trapped in death cave," he realizes that the boys need to clarify the main character in their story.

Jeff: Hey, Balah, start.
Balah: What? Trapped in—
Jeff: Trapped, who, who, who was trapped in death cave?
. . .
Balah: [Begins to reference the book] Once there was a boy trapped in death cave.

Example 15.

The boys continue typing and thinking of ideas to add to their story.

Balah: There was
Jeff: There was a curse on the cave, there was a curse on the cave! It says curse in here! [looking at book]
Balah: He was cursed. How do you spell cursed?
Jeff: I know how to spell cursed! It's on here, look, here. . . He was cursed
Balah: By a devil
. . .
Balah: And then a ghost came up and stole I
Jeff: I stole II
Balah: and ate his bones
Jeff: The dilt, the devil cursed him and then he did that

Balah: Oh, let's read it [the screen], "Once there was a boy who was trapped in death cave. He was cursed by a devil and died. His ghost came out."
Jeff: And he killed the whole, and he wanted to destroy the world!
Balah: And wanted to destroy the world [both boys laugh].
Jeff: Hey, our story's almost done, girls.

Although Balah was more skilled in reading, spelling and typing than Jeff, the flexible distribution of social behaviors throughout their interactions provided opportunities for both partners to exhibit some personal control over the use of the technology and the composing process. In this way, neither partner emerged as unequivocally higher in social status—as evidenced by the range of social behaviors they employed— than the other. The success of this partnership was the result of the interactive behaviors that emphasized social cohesion, joint purpose, and their dual participation in an equal range of social behaviors. Their joint purpose served to promote their relationship as male peers, distinguishing themselves along gender borders (Dyson, 1993a) from the girls whom they hoped to frighten with tales of dark caves, cursing devils, and bone-eating ghosts. Their shared sense of purpose for the activity is evident in their use of socially cohesive statements, and their approximately equal levels of acknowledgment of and agreement with one another's ideas. Their focus was on the product, which they saw as the vehicle to achieve their shared social goal.

Interaction Patterns and Social Behaviors Across Cases

As the case study descriptions highlight, the interaction patterns differed significantly across and within collaborative groups. A list of the most frequently observed social behaviors within each collaborative group is provided in Table 4. Not only did the dominant interaction patterns across partnerships reflect profound differences—fairness vs. power struggle vs. joint purpose—but the individual behavior patterns within each of the three groups were equally diverse. Charlotte regulated the turn-taking process, while Siddhi asserted her right to have a turn; Tyler directed and evaluated Beth as she reacted by defending her control; and Balah provided information as Jeff declared his plans for their story. Status-related differences were observed in the types of utterances and social behaviors children engaged in during the collaboration. Directing and providing information served as a means of establishing and maintaining a relatively high status within the interaction. In contrast, declaring and defending one's competence and requesting (or asserting one's right to) a turn were indicators of lower status—less control and power—within the partnership.

Several common patterns were seen across the three collaborative composing groups. Children used each other as resources, with most groups showing high levels of requesting and providing information across partners. In addition, collaborative partners voiced disagreements to each other's ideas, and tended to direct rather than instruct each other. Patterns observed across the three groups also included what Dickinson (1986) called discussion of local content or frequent planning talk "about the next word or phrase," and repeated discussion about spelling and punctuation (p. 364). All children used repetition to keep themselves focused and to regulate their

completion of writing words and phrases. Repetition included the rereading of the text on-screen, or the restating of a phrase that they were in the midst of writing.

Table 4: Dominant Social Behaviors: Comparisons Across Groups

Collaborative Group	Social Behaviors Characteristic of Group
Charlotte, Kelsey, Siddhi	Negotiating the turn-taking process Requesting/asserting one's turn Directing turns Providing information Suggesting ideas Acknowledging ideas Self-monitoring/repetition
Balah and Jeff	Disagreeing with partner Negotiating the turn-taking process Repetition Declarative planning
Tyler and Beth	Directing others' actions Disagreeing with partner Evaluating others' work Repetition

Similar to the first graders in Shatz et al. (1996), all three groups of children used self-monitoring behaviors, talking to themselves as they worked in order to focus and regulate their activity. Through this talk, children made public their cognitive processing of the composing task. The children's self-monitoring talk varied, but often included self-directed questions, sounding out or spelling words, searching for letters on the keyboard, or experimenting with the Kid Pix tools on the screen.

Example 17. Self-monitoring talk.

Tyler: Circle, eraser, uh, did I get the pencil? [speaking to himself as he looks at the screen]

...

Charlotte: They did /d/ /d/ /t/ [sounding out the word "didn't"].

...

Kelsey: Oh, I'll just put "did not." Did not. [after struggling to write "didn't"]

Similar to previous research (Heap, 1986; Kumpulainen, 1994; Shatz et al., 1996), the children's talk and behaviors were highly task-related throughout the interaction. In fact, the children protested against partners who were not task-focused, as exemplified by Kelsey and Charlotte who stated their dissatisfaction with Siddhi's "goofing" behaviors (see Example 6).

Discussion and Implications

Sociocultural theory emphasizes that development requires interaction and the presence of support from a more skilled partner. Our findings suggest

that even with minimal adult involvement, children exhibit many constructive patterns of interaction while composing collaboratively on computers. Young children interact while composing together in a highly task-focused manner, rarely digressing from conversation related to their composing activity. They also rely on each other as resources when they have questions about content, writing mechanics, or tool use. Thus, within their collaboration, the children in this study did provide each other with the scaffolding that is considered critical for development. Yet the children's support often consisted of direction rather than instruction, with explanations and elaborations seldom provided. Further investigations can clarify whether the support provided by peers during collaborative composing on computers provides adequately responsive scaffolding for extending cognitive competence.

According to sociocognitive theory, in order for collaboration to be effective, it should involve the expression of disagreement in terms of alternative perspectives. The children in this investigation did express disagreement to their partners, but not always in a manner to facilitate productive composing. Although some partners disagreed without contention, for others disagreement occurred within a pattern of interaction that was generally filled with conflict. In the latter case, interactions were negatively charged in a manner that often impeded productive collaboration. Further, disagreements were rarely followed with justifications or elaborations to help peers understand the reasons behind the opposition. In general, children's reactions to partner disagreement related to the overall affective tone of their group. Affectively positive interactions among group members signaled less overall contention in partner disagreements. In contrast, affectively negative interactions among partners was associated with higher levels of negativism when partner disagreements occurred.

One could raise the possibility that the interaction patterns observed were influenced by the fact that the children were composing in the media center, and not under direct supervision from their teacher. However, the context of using computers in the media center and working with the university visitors was not unfamiliar for these children. Because of the limited access to computers in the classroom, children regularly used computers in the media center. The negative interaction patterns observed upon close examination of children's activity were not readily apparent during the activity itself, even within the relatively quieter context of the media center. The investigators present during the sessions did not note particular difficulties between Beth and Tyler and were surprised to find evidence in the video tape and transcript analysis of the antagonistic interactions that had occurred in their presence. This pair engaged in discordant interactions without drawing attention to themselves through disruptive levels of vocalization or requests for adult assistance. With the multiple demands placed on teachers during ongoing classroom activity, conflict-filled interactions such as those occurring between Tyler and Beth would be easy to overlook. As observed by Kumpulainen (1994), the children focused their interactions on peers, and did not readily request assistance from the adult observer.

Similar to Dyson's (1993a) research, we observed that the children were involved in complex social work as they composed with peers on the computer screen. Children sought to gain attention and approval from peers, mark their uniqueness, and manipulate and/or maintain their relationships

with others. Within each group, children's talk and interactions with the computer reflected distinct social agendas. These agendas ranged from maintaining equality and fairness among peers, to conspiratorial decisions to arouse fear in the opposite sex, to assertion of power and personal control over others. Individual social goals were equally diverse, including placing oneself in the roles of director, information provider, evaluator, teacher, student, peer, and protester. All of these social purposes acted as guiding forces in children's composing talk and actions.

In this investigation, children's relative status among peers was associated with their overall participation within the interaction. As observed by Streeck (1983), stratification among the collaborative partners did occur. This was evidenced by the types of social behaviors children assumed within the interaction. High-status children displayed a higher quantity and quality of social behavior flexibility. High-status peers exhibited a greater range of social behaviors overall, in addition to the types of social behaviors that afforded them critical decision-making and facilitative power over the composing activity (e.g., directing peer behavior and the turn taking process). In contrast, low-status peers had less flexibility in the range of social behaviors they could employ, and more often behaved in ways that were devoid of power and control over their peers (e.g., requesting information and turns, defending one's competence).

As we hypothesized, children collaborated more effectively when they had an agreed upon system for turn-taking and sharing control of the tool. When children had a mutual understanding of the content of their composition, including a general conceptual framework for determining appropriate story content, their interactions were more often task-focused, as opposed to centering on one another's abilities and competence. In addition, when partners had the skills to build upon and incorporate one another's ideas, and did not differ tremendously in relative status, as seen with Balah and Jeff, the affective tone of the interaction was observed to be more positive. The range of social behaviors in which children engaged was less important for the success of the interaction than was the qualitative dimension of those social behaviors (i.e., the power and status associated with the behaviors).

As computers are becoming more commonplace in early childhood classrooms, and teachers are increasingly incorporating technology into their literacy curricula, the need to understand how to optimize children's collaborative interactions around computer activities is becoming more important. The ratio of children to computers within classrooms and across schools often makes it necessary for teachers to group children when involving them in computer activities. Additionally, many teachers view the social interaction of group work as important in computer use. Our results suggest that in order for teachers to support all children's success within these activity settings, they need to be aware of both the positive and negative peer discussion and behaviors that often accompany young children's collaborative interactions. Recognizing this full range of possibilities up front empowers teachers to carefully structure these collaborative activity settings for success. Watchful facilitation of collaborative activities provides opportunities for teachers to support constructive behavior while preventing unfavorable actions from taking place, thereby reaping the fuller benefits of the technology in support of children's literacy development. In our final sec-

tion, we outline suggestions for teachers interested in arranging successful collaborative computer tasks in early childhood classrooms.

Suggestions for Practice

Our findings lead to two suggestions for how the effectiveness of young children's collaborative composing can be enhanced. First, the observed variability in partners' effectiveness at negotiating turns and control reveal the need for teachers to model prosocial, effective ways to engage in collaborative interactions. Our focal groups varied in their effectiveness at negotiating control of the tool, turn-taking, and story content, with one group exhibiting particular difficulty at maintaining positive and productive exchanges. Teachers can assist children in negotiating control by modeling such behaviors as how to share control of the technology, request information from peers, acknowledge other's requests, evaluate products rather than partners, and incorporate ideas from all participants. Modeling how to share control of the technology may be particularly important for young children, who have limited social skills. Providing this assistance may reduce the difficulties in transfer of control observed by Daiute and Dalton (1993) and will facilitate inclusion of low-status members, who are less likely to have the power to secure a turn. One way for teachers to support the development of children's turn-taking skills would be to carefully observe the various ways children negotiate the process of turn-taking prior to intervention. Teachers could then select effective turn-taking strategies and make them explicit to all children within a class discussion. After drawing on observations of children's experiences, teachers could extend the discussion by introducing alternative turn-taking strategies and asking children to suggest additional approaches.

Encouraging children to request information and acknowledge others' requests is critical in getting them to support each other's learning. By showing children how to maintain a focus on evaluating the product rather than the person, teachers can curtail the emergence of defensive and negative behaviors. Emphasizing the importance of incorporating ideas from all participants may diminish the tendency for high-status individuals to dominate the activity, while low-status children are blocked from participation.

Second, teachers need to actively assist children in learning how to extend their collaborative focus beyond the local context of their compositions. In each of the groups examined, children focused on planning the immediate next addition to the story or monitoring spelling and punctuation rather than discussing the possibilities and consequences of various story options. Our evidence therefore suggests that young children seldom explore alternative ideas or construct hypotheses while writing collaboratively on computers. It must be kept in mind that these children are young composers, in first grade, a period during which most of them are still just learning to read and write conventionally. While children can focus more broadly on content during the emergent period when they are not bound to conventional spelling and reading, they often narrow their focus to local actions and local planning during the initial conventional period (Kamberelis & Sulzby, 1988;

Sulzby, Barnhart, & Hieshima, 1989). Nevertheless, teachers can use scaffolding and modeling during compositional planning to refocus young children's attention beyond the local or immediate demands of the task. For example, teachers can facilitate this process by thinking out loud as they compose with children. They could also ask children to think of several ways a story character might respond to a conflict and then encourage them to suggest alternative ideas as they are writing with peers.

Even during their first years of schooling, children have the potential to effectively collaborate while composing on computers. These results are encouraging, since many schools have limited computer resources and many educators value the process of collaboration. Children's status and social goals will influence their patterns of interaction and participation during collaboration. By observing children's status relative to their peers and attending to their social goals while composing, teachers can help children develop positive interaction patterns during collaborative activities on computers.

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The Center for the Improvement of Early Reading Achievement (CIERA) is the national center for research on early reading and represents a consortium of educators in five universities (University of Michigan, University of Virginia, and Michigan State University with University of Southern California and University of Minnesota), teacher educators, teachers, publishers of texts, tests, and technology, professional organizations, and schools and school districts across the United States. CIERA is supported under the Educational Research and Development Centers Program, PR/Award Number R305R70004, as administered by the Office of Educational Research and Improvement, U.S. Department of Education.

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Readers and Texts

Characteristics of readers and texts and their relationship to early reading achievement. What are the characteristics of readers and texts that have the greatest influence on early success in reading? How can children's existing knowledge and classroom environments enhance the factors that make for success?

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Home and School

Home and school effects on early reading achievment. How do the contexts of homes, communities, classrooms, and schools support high levels of reading achievement among primary-level children? How can these contexts be enhanced to ensure high levels of reading achievement for all children?

CIERA INQUIRY 3
Policy and Profession

Policy and professional effects on early reading achievement. How can new teachers be initiated into the profession and experienced teachers be provided with the knowledge and dispositions to teach young children to read well? How do policies at all levels support or detract from providing all children with access to high levels of reading instruction?

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